EFFECT OF THE DISTANCE BETWEEN VERTICAL DRAINAGE COLUMN IN CLAY SOIL AGAINST SETTLEMENT DUE TO DISTRIBUTED LOAD

Final Project

to complete the requirements to achieve S-1
graduate in Civil Engineering

Prepared by :

Azam Amrulloh
NIM : D 100 134 002

CIVIL ENGINEERING DEPARTMENT
ENGINEERING FACULTY
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APPROVAL SHEET

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Final Project

Submitted and defended in Final Examination of

Final Project in front of the board of examniners

On October 13rd, 2017

prepared by:

Azam Amrulloh

D 100 134 002

The board of examiners:

Advisor

Agus Susanto, S.T., M.T.

NIK. 787

First Examiner

Anto Budi Listyawan, S.T., M.Sc.

NIK. 913

Second Examiner

Ir. Renaningsih, M.T.

NIK. 733

The Final Project is accpeted in partial fulfilment of requirements

for achieving S-1 graduated degree of Civil Engineering

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Dean of Engineering Faculty

Ir. Sri Sunarjono, M.T., Ph.D.

NIK. 682

Head of Civil Engineering Department

Mochamad Solikin, S.T., M.T., Ph.D.

NIK. 792

FINAL TASK STATEMENT

I am the undersigned below :

Name	:	Azam Amrulloh
NIM	:	D 100 134 002
Faculty/Department	:	Engineering/Civil Engineering
Title	:	Effect of The Distance Between Vertical Drainage Column in Clay Soil Against Settlement Due to Distributed Load

Stating that the final project that I created and submit it is the result of my own work, except all the quotes I have described its sourced. If at a later emotion can be proved that the thesis traced, then I am willing to accept sanctions in accordance with the rules that have been created.

Surakarta, 2017

Author,

Azam Amrulloh

PREFACE

Assalaamu'alaikum Wr Wb.

Alhamdulillah, all praise of gratitude is praised to the presence of Allah S.W.T over the abundance of grace, taufik and hidayah allah so that the preparation of the Final Project can be completed. This Final Project is prepared to complete th e requirements to complete the S1 degree program at the Engineering Faculty Civil Engineering Department University Muhammadiyah of Surakarta. With this the authors would like to thank all those who have provided support so that the authors can complete this Final Project.

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Author realized that there is no perfect thing, therefore critics and constructive suggestions for the perfection extremely authors expect at this final and hopefully, this final can be useful for us. Amin.

Wassalamu'alaikum Wr Wb.

Surakarta, August 2017

Author

Motto

- ✓ Sebuah tantangan akan selalu menjadi beban, jika hanya dipikirkan.
- ✓ Sebuah cita-cita adalah beban, jika hanya di angan-angan.
- ✓ Senyum Ibu adalah semangat juang.
- ✓ Berpikirlah seperti berpikirnya Rasulullah.
- ✓ "Beruntunglah bagi orang-orang mukmin"

  (QS. Al-Mukminun:1)
- ✓ "Apakah manusia itu mengira bahwa mereka di biarkan (saja), mengatakan, "Kami telah beriman, sedangkan mereka tidak di uji?".

  (QS. Al-Ankabut:1)

DEDICATION

By the say Alhamdulillah,

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SYMBOL AND NOTATIONS

Gs = Specific Gravity

P I = Plasticity Index

ɤs = Weight of the Solid Grain Volume (gram/cm^3)

ɤw = Weight of Volume Water (gram/cm^3)

w = Water Content (%)

W_w = Water Weight (gr)

W_s = Water Dry Weight (gr)

GI = Group Index

F = Passing Finer in Percent No.200

LL = Liquid Limit

USCS = Unified Soil Classification System

AASHTO = American Association of State Highway and Transportation Office

S_t = Total Settlement

S_i = Immediate Settlement

S_p = Primary Consolidation Settlement

S_s = Secondary Consolidation Settlement

ABSTRACT

In Java region there's type of clay that can be found in several areas in Central Java, such as Blora, Purwodadi, Solo, Sragen, Klaten. In this study the land used as sample from Troketon Pedan Klaten village which has a PI value of 50.20%, so making it less beneficial for contruction. In this study the property of the soil is improved by vertical drainage reinforcement. The aim of this research is to determine the value of soil settlement that is influenced by the distance between columns 100 cm and 50 cm due to the distributed load on it. In this research put sand 5 cm, then put the soil into box which has been paired column mold as much as 3 layers, each layer is given a blow 25 times, then it's saturated with water for four days, then the water removed through the valves and then being kept for 24 hours, then column mold filled with sand, lime, mixture of sand and lime, sand over lime, lime over sand, put the sand 5 cm, then three dials paired and given a distributed load on it. The results showed that smallest soil settlement value was found on soil using lime with spacing between column 50 cm 2.11mm, while the biggest settlement value occurred on soil using sand column with distance of coloumn 50 cm is 5.31 mm, near the lime column distance the smaller the decrease value. While on the variation of sand and lime combination as the reinforcement of soil obtained the least value of the settlement occurred on the variation of lime columns above the sand with a distance between columns 100 cm of 3.05 mm.

Keywords: Distance variation, Soil settlement, Vertical drainage.

ABSTRAK

Di wilayah Jawa memiliki jenis lempung yang bisa ditemukan di beberapa daerah di Jawa Tengah antara lain Blora, Purwodadi, Solo, Sragen, Klaten. Dalam penelitian ini tanah yang digunakan sampel dari desa Troketon Pedan Klaten yang memiliki nilai PI 50,20%, sehingga kurang menguntungkan bagi kontruksi. Dalam penelitian tanah diperbaiki dengan perkuatan drainase vertikal. Penelitian ini bertujuan untuk mengetahui nilai penurunan tanah yang dipengaruhi jarak antar kolom 100 cm dan 50 cm akibat beban merata di atasnya. Pada penelitian ini pengujian dilakukan dengan memasukkan pasir 5 cm, kemudian masukkan tanah ke dalam box yang sudah dipasang cetakan kolom sebanyak 3 lapis, setiap lapis diberi pukulan 25 kali, lalu dijenuhkan dengan air selama empat hari, kemudian air dikeluarkan melalui kran dan ditunngu selama 24 jam, setelah itu kolom drainase diisi material pasir, kapur, campuran pasir dan kapur, pasir di atas kapur, kapur di atas pasir, kemudian masukkan pasir 5cm, pasang tiga dial dan diberi beban merata di atasnya. Hasil pengujian menunjukkan bahwa nilai penurunan tanah terkecil terdapat pada tanah menggunakan kolom kapur dengan jarak antar kolom 50 cm yaitu 2,11mm, sedangkan nilai penurunan paling besar, terjadi pada tanah menggunakan kolom pasir dengan jarak antara kolom 50 cm yaitu 5,31 mm, semakin dekat jarak kolom kapur semakin kecil nilai penurunanya. Sedangkan pada variasi penggabungan pasir dan kapur sebagai perkuatan tanah diperoleh nilai penurunan paling kecil, terjadi pada variasi kolom kapur di atas pasir dengan jarak antara kolom 100 cm yaitu 3,05 mm.

Kata kunci : Drainase Vertikal, Penurunan tanah, Variasi jarak.